NW Transmission System Bottlenecks and Impacts of 2005 Summer Operation

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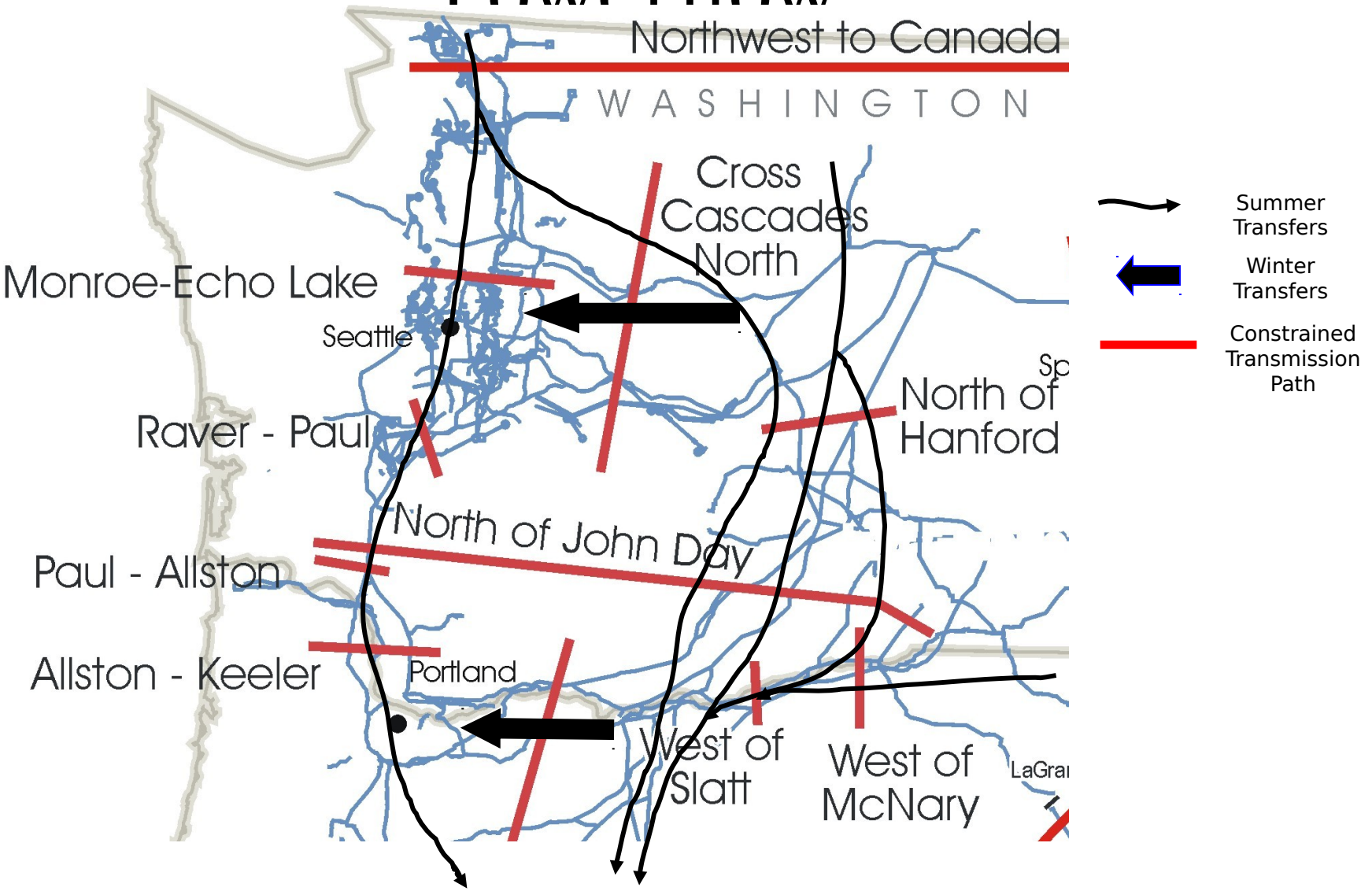
Transmission Loading Characteristics

- NW load peaks in Winter
  - Heaviest power flows are east to west
- California peaks in Summer
  - Heaviest power flows are north to south

Figure 1: NW Paths & Seasonal Direction of Powerflow



Summer 2005 Problem Areas

- North of Hanford Path
  - Monitors flow of power on two 500-kV lines on eastside of Cascade Mountains.
- Paul-Allston Path
  - Monitors flow of power on two 500-kV lines between Olympia and Longview.
- Allston-Keeler Path
  - Monitors flow on one 500-kV line between Longview and Portland

Transmission Impacts of Increased Spill on Lower Snake and Lower Columbia Projects

- Reducing generation on the Lower Snake and Lower Columbia plants:
  - Increases North to South flow across problem paths (see next 2 slides)
  - Reduce transfer capability from NW to California

Figure 2: North of Hanford Flow

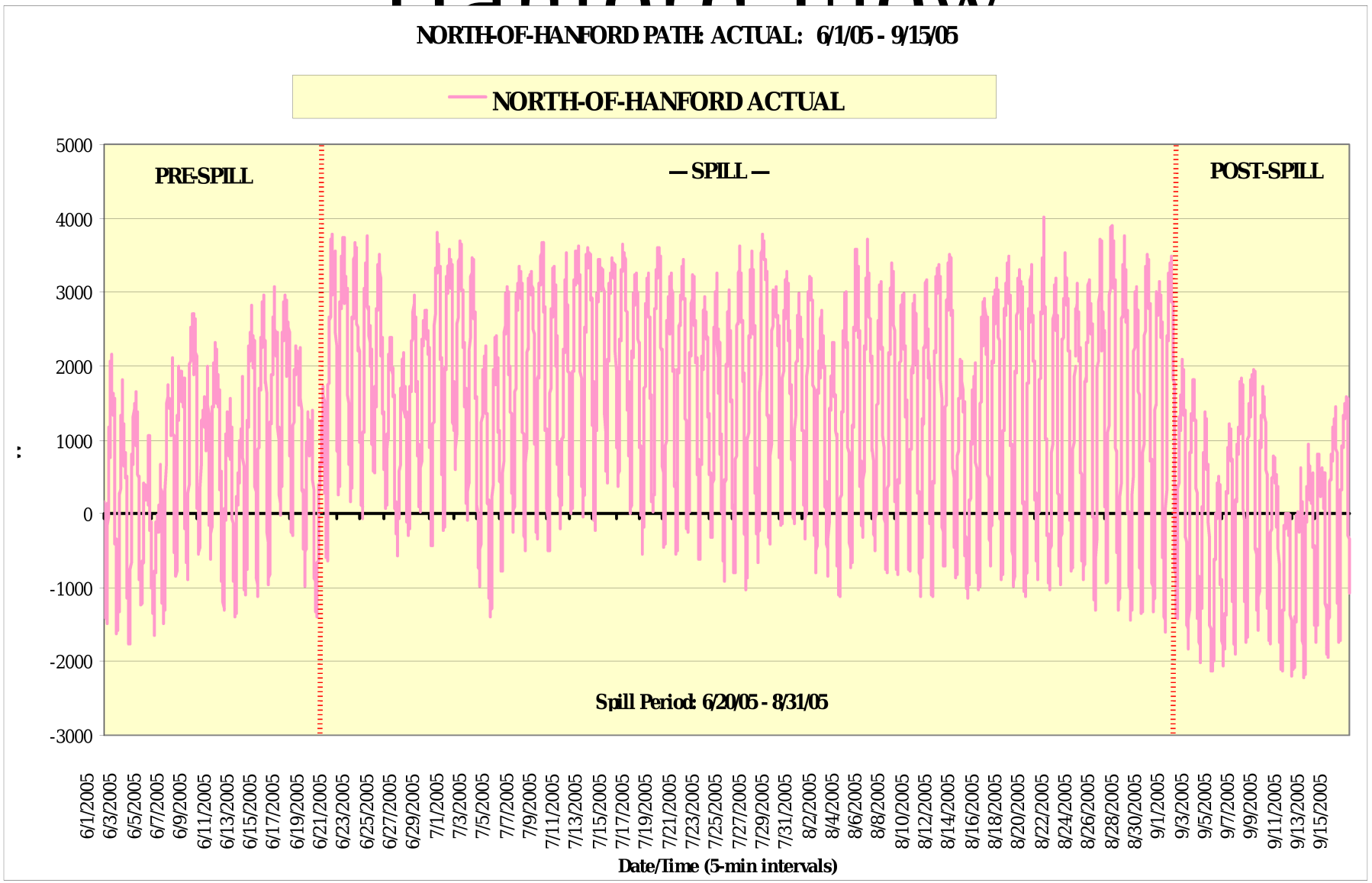
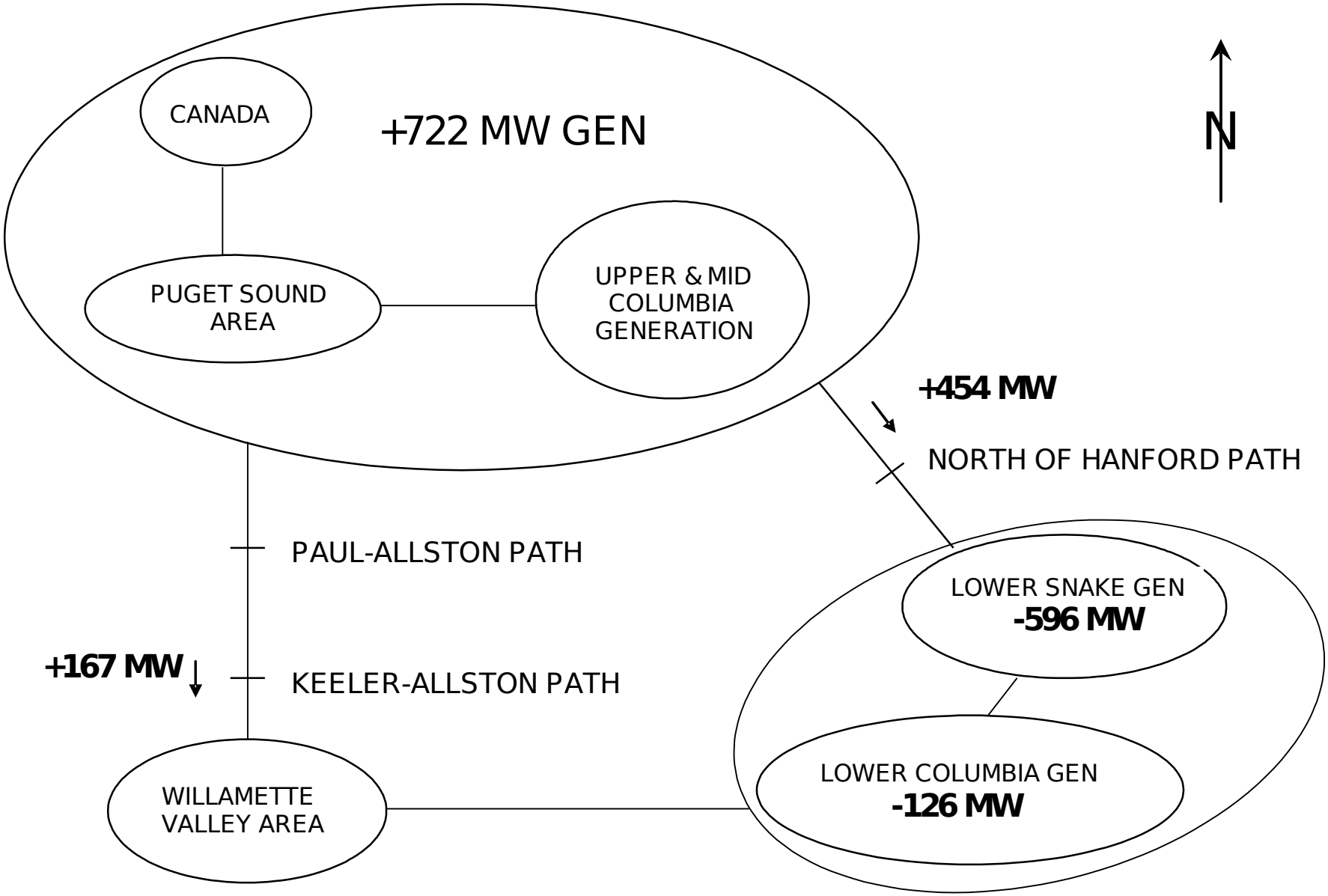


Figure 3: Peak Generation Changes between 6/17/05 & 6/21/05



SUMMER 2005 INCREASED SPILL OPERATIONS RESULTED IN GREATLY INCREASED POWER FLOW FROM NORTH TO SOUTH OVER KEY CONSTRAINED TRANSMISSION PATHS

Problems

- Exceeding the Operational Transfer Capability (OTC) of these paths
  - Operating above an OTC creates risk of unreliable system response to critical contingences
  - WECC requires that the actual flow on these paths get below the OTC within 30 minutes
  - Amount of OTC excursions and time above OTC was significantly higher in Summer 2005 than Summer 2004

FIGURE 4: PATH FLOWS OVER OTC (JUN-AUG 04 & 05)

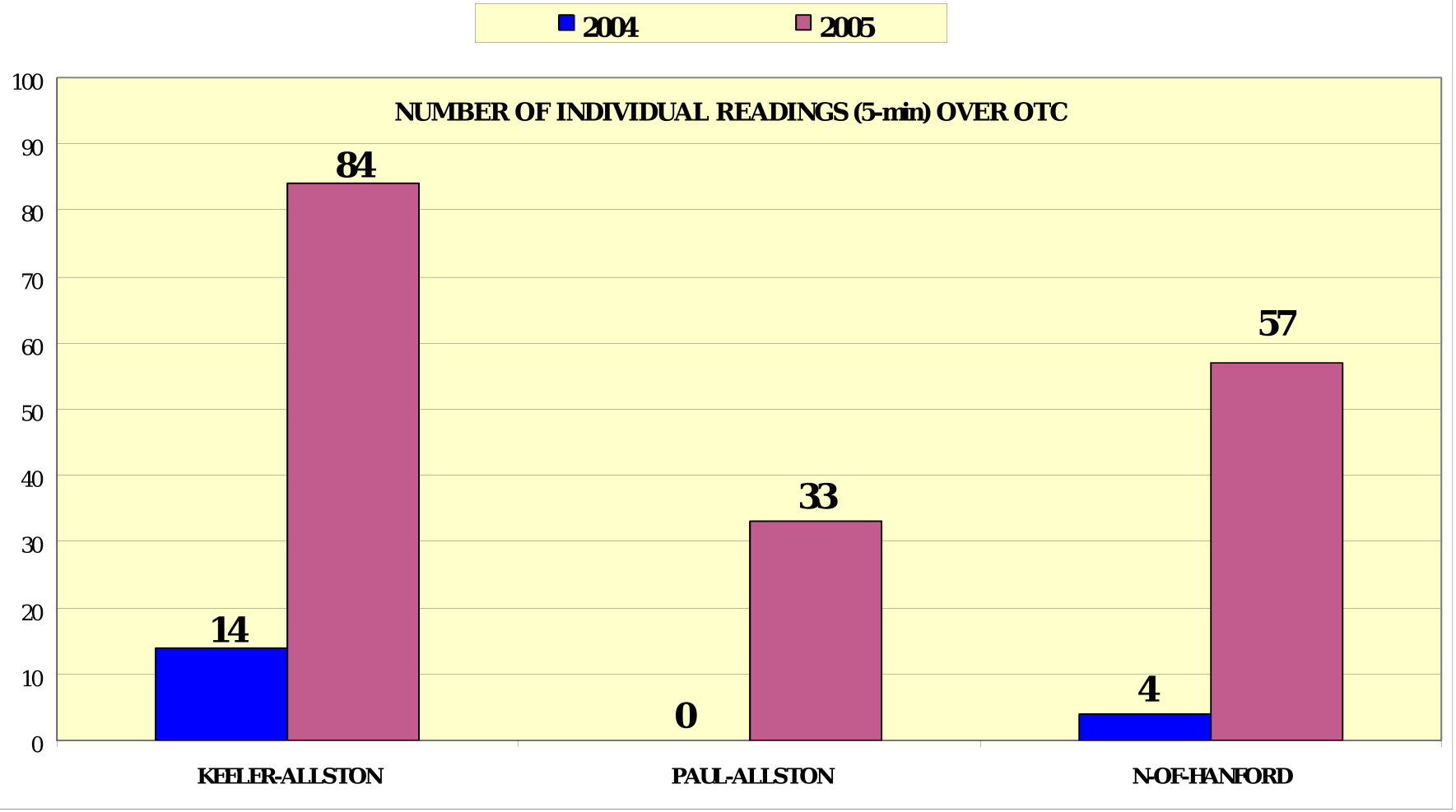
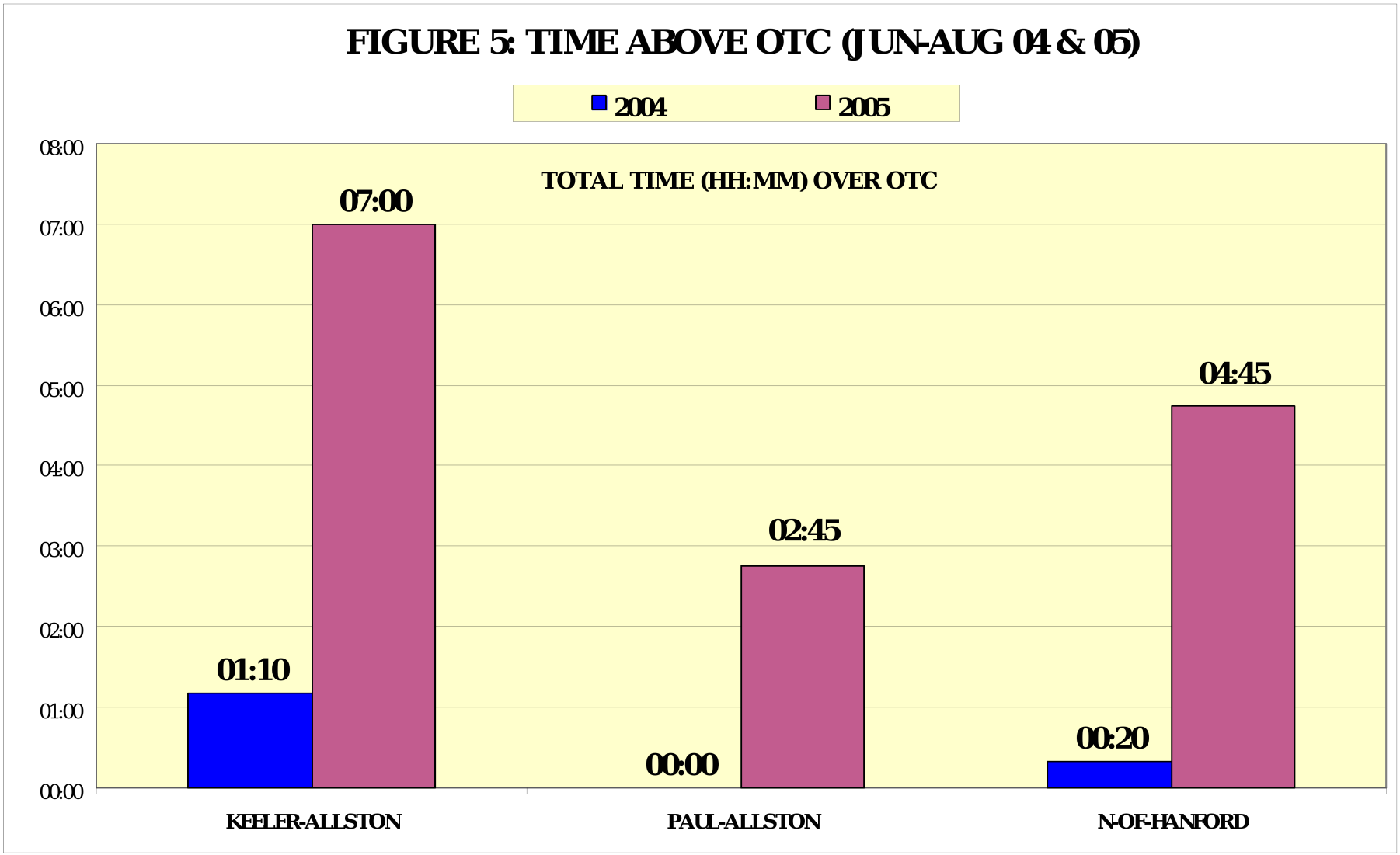


FIGURE 5: TIME ABOVE OTC (JUN-AUG 04 & 05)



Response to OTC Excursions

- In August 2005 there were 29 periods when the OTC of one of these paths was exceeded for at least 5 minutes (Table 1)
- 20 of these OTC excursions required dispatcher action to reduce the flow on the path (Table 2)
- In some cases, the dispatcher action is significant

TABLE 1: OTC EXCURSIONS IN AUGUST 2005

EVENT	PATH	START EXCURSION	EXCURSION DURATION (mm:ss)	EXCURSION MAX MW OVER OTC
1	Paul-Allston	04-Aug-05 10:57:00	05:00	14.2
2	Paul-Allston	04-Aug-05 11:04:50	12:50	75.6
3	Paul-Allston	04-Aug-05 11:53:00	06:10	57.3
4	Keeler-Allston	04-Aug-05 13:55:50	06:00	43.2
5	Keeler-Allston	04-Aug-05 16:46:40	08:20	12.8
6	Keeler-Allston	04-Aug-05 17:13:10	06:40	17.0
7	Paul-Allston	05-Aug-05 09:50:10	30:00	122.1
8	Keeler-Allston	05-Aug-05 13:09:20	20:40	36.4
9	Keeler-Allston	06-Aug-05 16:22:30	**05:50**	**227.9**
10	Paul-Allston	09-Aug-05 11:57:30	08:30	51.7
11	Paul-Allston	12-Aug-05 10:16:30	28:40	55.1
12	Paul-Allston	12-Aug-05 10:59:00	05:10	23.6
13	Paul-Allston	12-Aug-05 11:06:50	25:10	46.8
14	Paul-Allston	17-Aug-05 10:06:30	07:20	46.3
15	North-of-Hanford	20-Aug-05 17:54:40	**07:30**	**359.0**
16	Keeler-Allston	25-Aug-05 14:04:00	16:00	30.9
17	Keeler-Allston	25-Aug-05 15:10:10	12:40	38.3
18	Paul-Allston	26-Aug-05 09:55:50	17:50	73.8
19	Keeler-Allston	26-Aug-05 12:42:20	15:00	55.9
20	North-of-Hanford	26-Aug-05 12:54:50	28:30	220.6
21	Keeler-Allston	26-Aug-05 13:03:00	20:10	61.3
22	Keeler-Allston	26-Aug-05 13:27:10	17:50	72.7
23	North-of-Hanford	26-Aug-05 13:27:50	18:50	147.7
24	North-of-Hanford	26-Aug-05 14:00:00	20:20	146.4
25	Keeler-Allston	26-Aug-05 14:02:20	10:30	36.0
26	North-of-Hanford	26-Aug-05 14:27:10	18:00	109.0
27	North-of-Hanford	26-Aug-05 15:11:30	24:10	73.3
28	North-of-Hanford	27-Aug-05 16:26:00	09:40	73.3
29	Keeler-Allston	27-Aug-05 16:28:10	06:50	20.2

Shaded times indicate simultaneou problems on multiple paths

BOLD Indicates excursion caused by line outage

TABLE 2: DISPATCHER ACTIONS

					BPA DISPATCHER ACTIONS			
EVENT	PATH	START EXCURSION	EXCURSION DURATION (mm:ss)	EXCURSION MAX MW OVER OTC	A. BYPASS SERIES CAPACITORS (#bypassed)	B. REQUEST PHASE SHIFTER OPERATION	C. PBL GENERATION REDISPATCH	D. CURTAIL SCHEDULES
2	Paul-Allston	04-Aug-05 11:04:50	12:50	75.6	Yes (4)		140 MW UC to LC	106 MW
4	Keeler-Allston	04-Aug-05 13:55:50	06:00	43.2	Yes (4)			
6	Keeler-Allston	04-Aug-05 17:13:10	06:40	17.0			200 MW UC to LC	
7	Paul-Allston	05-Aug-05 09:50:10	30:00	122.1	Yes (4)		300 MW UC to LC	191 MW
8	Keeler-Allston	05-Aug-05 13:09:20	20:40	36.4	Yes (4)		140 MW UC to LC	182 MW
10	Paul-Allston	09-Aug-05 11:57:30	08:30	51.7	Yes (4)	100 MW W to E		
11	Paul-Allston	12-Aug-05 10:16:30	28:40	55.1	Yes (4)	50 MW W to E	200 MW UC to LC	345 MW
13	Paul-Allston	12-Aug-05 11:06:50	25:10	46.8		100 MW W to E		110 MW
14	Paul-Allston	17-Aug-05 10:06:30	07:20	46.3	Yes (4)	Yes	200 MW UC to LC	400 MW
16	Keeler-Allston	25-Aug-05 14:04:00	16:00	30.9			200 MW UC to LC	222 MW
17	Keeler-Allston	25-Aug-05 15:10:10	12:40	38.3			100 MW UC to LC	72 MW
18	Paul-Allston	26-Aug-05 09:55:50	17:50	73.8	Yes (4)	50 MW W to E	200 MW UC to LC	356 MW
19	Keeler-Allston	26-Aug-05 12:42:20	15:00	55.9	Yes (4) / No (4)	100 MW W to E	Not Available	286 MW
20	North-of-Hanford	26-Aug-05 12:54:50	28:30	220.6	No (4)			
21	Keeler-Allston	26-Aug-05 13:03:00	20:10	61.3				450 MW
22	Keeler-Allston	26-Aug-05 13:27:10	17:50	72.7				300 MW
25	Keeler-Allston	26-Aug-05 14:02:20	10:30	36.0				
26	North-of-Hanford	26-Aug-05 14:27:10	18:00	109.0				300 MW
27	North-of-Hanford	26-Aug-05 15:11:30	24:10	73.3			Declined	
28	North-of-Hanford	27-Aug-05 16:26:00	09:40	73.3			200 MW	

Shaded times indicate simultaneou problems on multiple paths

Definitions: UC = Upper Columbia, LC = Lower Columbia

Summary

- Increased spill changes generation patterns and increased north to south flow on the NW transmission system
- The transmission system was operated “closer to the edge” in summer 2005 than summer 2004 (i.e., significantly more OTC excursions)
- OTC excursions can result in significant dispatcher action to control

The End